COMPUTER SCIENCE AND ECONOMICS

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Computer Science and Economics (CSEC) is an interdepartmental major for students interested in the theoretical and practical connections between computer science and economics. The B.S. degree in CSEC provides students with foundational knowledge of economics, computation, and data analysis, as well as hands-on experience with empirical analysis of economic data. It prepares students for professional careers that incorporate aspects of both economics and computer science and for academic careers conducting research in the overlap of the two fields. Topics in the overlap include market design, computational finance, economics of online platforms, machine learning, and social media. The CSEC major requires some classes in the intersection between Computer Science and Economics which are not mandatory for either major.

PREREQUISITES

Prerequisite to this major is a basic understanding of discrete math, calculus, microeconomics, and macroeconomics. Grades of 4 or 5 on high-school AP computer science, statistics, calculus, microeconomics, and macroeconomics signal adequate preparation for required courses in the CSEC major. For students who have not taken these or equivalent courses in high school, the discrete mathematics prerequisite may be satisfied with CPSC 2020 or MATH 2440; the calculus prerequisite may be satisfied with MATH 1120; the microeconomics prerequisite may be satisfied with ECON 1110 or ECON 1115; and the macroeconomics prerequisite may be satisfied with ECON 1111 or ECON 1116. Other courses may suffice, and students should consult the director of undergraduate studies (DUS) and their academic advisers if they are unsure whether they have the prerequisite knowledge for a particular required course.

REQUIREMENTS OF THE MAJOR

See Links to the attributes indicating courses approved for the Computer Science and Math Requirements (*YC CSEC Elective not CS or EC*; *YC CSEC Elctv intrsectn CS/EC*).

The B.S. degree program requires successful completion of fourteen term courses (not including courses taken to satisfy prerequisites) and the senior project. Nine of the fourteen courses are listed below; the remaining five courses are electives. With permission of the DUS and the academic adviser, a student may substitute a more advanced course in the same area as a required course. When a substitution is made, the advanced course counts toward the nine required courses and *not* toward the five electives.

The required courses include CPSC 2010; 2230; 3230; 3650 or 3660; ECON 2121 or 2125; two courses in econometrics (ECON 1117 and 2123 or ECON 2135 and ECON 2136); one course in game theory ECON 3351 or CPSC 4550; one course in the intersection of computer science and economics (e.g., CPSC 4550, ECON 4417, 4433, 4486, 4441, 4435, 4478 or CPSC 4740) which may not also count as one of the five remaining electives or for the game theory requirement. S&DS 2410 and 2420 may be

taken instead of ECON 2135. Only CPSC 3650 or CPSC 3660 may be taken for major credit.

Elective courses are essentially those courses that count as electives in the Computer Science major, the Economics major, or both. ECON 2122, ECON 2159, and ECON 6672 can count as Economics electives. S&DS 3650 can count as an elective in a related field. At least two electives must be taken in the Computer Science department, and at least one must be taken in the Economics department. With the permission of the academic adviser, a student may use as the fourth and/or fifth elective (one or two courses) in related departments that do not usually serve as electives in Computer Science or Economics.

Searchable attributes: YC CSEC Elective not CS or EC; YC CSEC Elctv intrsectn CS/EC

Credit/D/Fail No course taken Credit/D/Fail may be applied toward the requirements of the major.

Outside credit Courses taken at another institution or during an approved summer or term-time study abroad program may count toward the major requirements with DUS approval.

SENIOR REQUIREMENT

In the senior year, each student must complete CSEC 4910, a one-term independent-project course that explicitly combines both techniques and subject matter from computer science and economics. A project proposal must be approved by the student's academic adviser and project adviser, and it must be signed by the DUS by the end of the third week of the term.

Distinction in the Major Computer Science and Economics majors may earn Distinction in the Major if they receive grades of A or A– in at least three quarters of their courses in the major (not including courses taken to satisfy prerequisites), and their senior-project advisers determine that their senior projects are worthy of distinction.

ADVISING

Approval of course schedules Students considering the major but not yet declared should arrange to meet with the DUS during the registration period to ensure that their proposed course schedules are appropriate. Similarly, declared majors should meet with their academic advisers to ensure that they are on track to satisfy all of the requirements of the major. Course schedules must be signed by the DUS each term, and they must be approved by an academic adviser before the DUS signs them.

Transfer credit Students who take a term abroad or take summer courses outside of Yale may petition the DUS to count at most two courses from outside Yale toward the requirements of the major. Students who take a year abroad may petition to count at most three courses. Many courses taken outside Yale do not meet the standards of the CSEC major; therefore, students should consult with their academic advisers and the DUS *before* taking such courses. Courses taken outside Yale may not be counted toward the major requirements in intermediate microeconomics, econometrics, or the intersection of computer science and economics.

SUMMARY OF MAJOR REQUIREMENTS

Prerequisites Basic knowledge of discrete math, calculus, microeconomics, and macroeconomics; determined by DUS and academic advisers as indicated

Number of courses 14 term courses (not incl prereqs or senior req)

Specific courses required CPSC 2010, 2230, and 3230; CPSC 3650 or 3660; ECON 2121 or 2125; ECON 1117 and 2123 or ECON 2135 and ECON 2136; ECON 3351 or CPSC 4550

Distribution of courses 1 course in intersection of CPSC and ECON, as specified; 5 electives as specified

Substitution permitted S&DS 2410 and 2420 may substitute for ECON 2135; a more advanced course in the same area may substitute for a required course with DUS and academic adviser permission

Senior requirement CSEC 4910